DRAFT SUBJECT TO REVISION

United States
Department of
Agriculture

Forest Service

Northeastern Area

Original

1985 Spruce Budworm
Suppression Project On
Passamaquoddy Indian
Tribal Lands, Maine

Post-Treatment Evaluation

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SUMMARY

The Passamaquoddy Indian Forestry Department treated 6,742 acres in T4ND to protect spruce from spruce budworm damage. Dipel 6L was applied undiluted at 32 fl oz/acre and 12 BIU's per acre using Snow Thrush aircraft equipped with Mini-Micronair (AU-5000) rotary atomizers.

In the two treated areas, spruce budworm mortality was 97.2 and 94.2 percent, and in the unsprayed area, the mortality was 97.6 percent. One spray block had statistically (p=0.05) less mortality than either the other spray block or the unsprayed area. Defoliation ranged from 33 percent in the unsprayed area to 22 percent in the lower mortality spray block, but the differences were not statistically significant.

INTRODUCTION

Based on a biological evaluation conducted in the fall of 1983 and winter of 1984, the USDA Forest Service recommended as one of the alternatives aerial application of Bt.[1]/ The Passamaquoddy Indian Forestry Department (PFD) requested and received suppression funds to protect red spruce from spruce budworm defoliation. The PFD planned and carried out the suppression project on 6,742 acres in T4ND. The USDA Forest Service's Durham Field Office provided technical assistance to the PFD to implement and evaluate the suppression project. This report summarizes that evaluation.

APPLICATION

Dipel 6L was pumped from 55 gallon drums into a holding tank SELMA before loading into the Snow Thrush aircraft (Precision Air, ~~Foley~~ AL). The Snow Thrush had six mini-Micronair (AU-5000) rotary atomizers and the spray plane flew at 110 mph and 50 feet above tree tops. The Dipel 6L (Abbott Laboratories) was applied at 32 fl. oz/acre to give a dosage of 12 BIU's/acre. The boom pressure was 40 psi; atomizer blade pitch was set at 45°; and VRU's were set at 11. The swath width was 300 feet and the liquid flow rate used for calibration was 0.80 times slower than water.

Another plane [redacted] acted as both monitor and guide for the spray aircraft. This plane flew above and ahead of the spray aircraft and flew individual swaths.

The following weather guidelines were used to apply spray:

(1) drip dry foliage
(2) no rain forecast for four hours
(3) windspeed greater than 3 mph but less than 15 mph
(4) no inversion layers present below spray aircraft
(5) air temperature during spraying between 32°F and 80°F
(6) budworm feeding activity expected within 36-48 hours (temperature above 55°F).

Our target was to treat budworm populations at peak fourth instar, using the Maine Forest Service system to determine larval instars. Spraying began on Sunday 6/2/85 and ended on Tuesday 6/4/85. The larval index in T4ND was 4.12 on 6/3/85. Spruce bud index was about 2.7 on 6/3/85 and about 4.2 one week later (Appendix A).

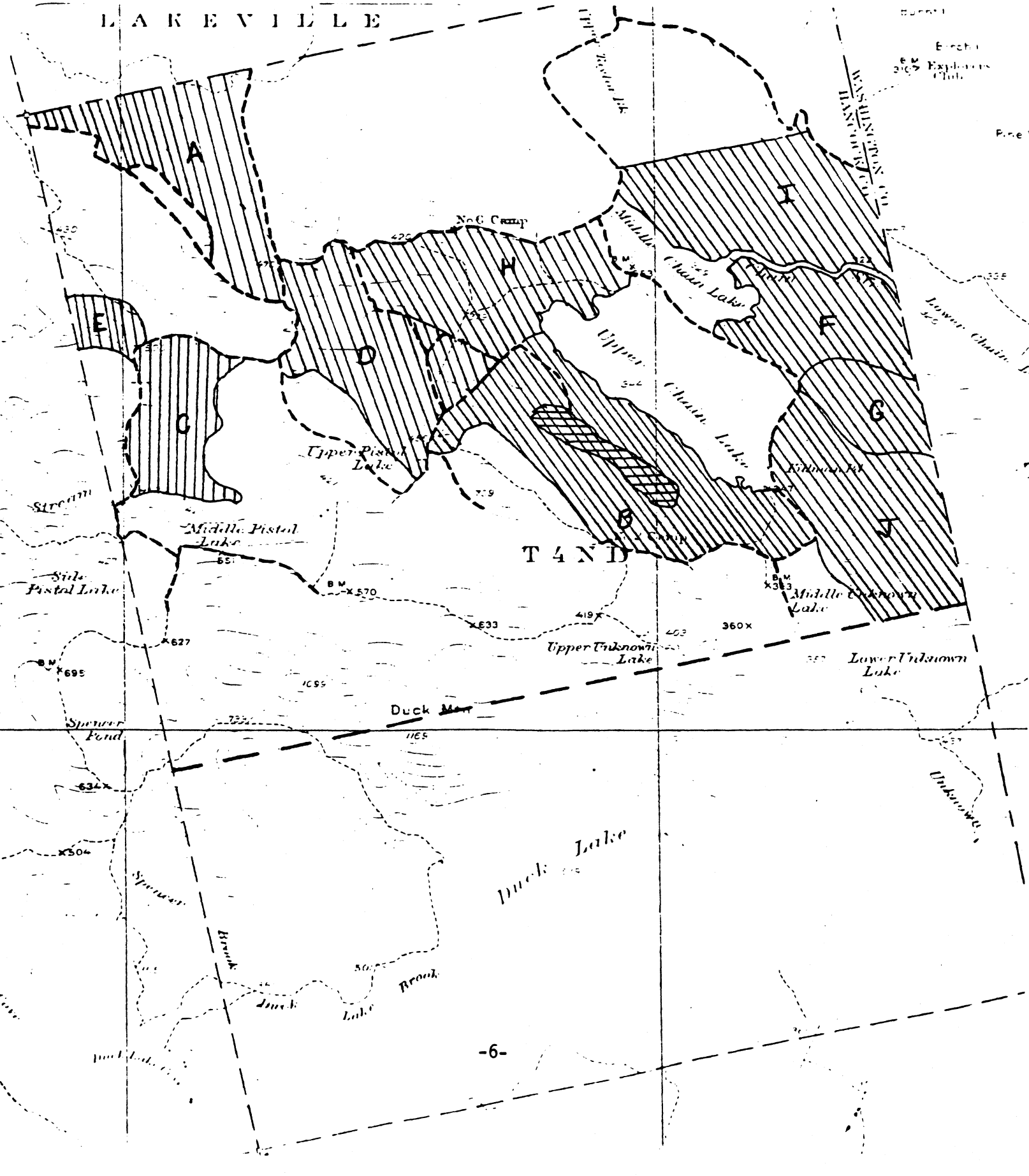
EVALUATION

1. Sample Clusters

Each sample line consisted of 20 dominant/codominant spruce trees. We established 10 sample lines in spray block A (NW block) and 10 sample lines in spray blocks F and G and 9 sample lines in an unsprayed check area to the north of T4ND (SE block) (Fig.1).

1/ Souto, D. 1985 Spruce Budworm on Passamaquoddy Indian Tribal Lands, Maine. USDA Forest Service Northeastern Area, Internal Biological Evaluation Report. 9 p.

Figure 1.--Passamaquoddy Indian Forestry Department 1985 spruce budworm project spray blocks.



2. Prespray Survey

Field crews collected one 18-inch midcrown branch from each sample tree three days or less before spraying. The branches were taken to the Passamaquoddy Laboratory in Topsfield and searched for budworm larvae.

3. Postspray Survey

Field crews collected one 18-inch midcrown branch from each sample tree in early July after larval feeding had ceased. In the Passamaquoddy Laboratory, budworms were counted and defoliation estimated. For each branch, 50 current shoots were rated in ten percent defoliation classes and these estimates were averaged to derive whole branch defoliation. We counted mined buds that did not elongate as well as defoliated current shoots.

4. Spray Deposit Assessment

One midcrown twig (about six inches long) was collected from each sample tree after the area was treated. Twigs were packaged in envelopes and taken to the Durham Field Office. In a transfer hood, 20 previous year's (1983) needles were removed from each twig and placed in petri dishes on tripticase soy agar. After incubating for 2-3 days, we determined the proportion of needles with Bt colonies. Sample Bt colonies were examined under a microscope to confirm the presence of Bt crystals.

RESULTS

There were no significant prespray differences in budworm populations between the unsprayed and sprayed areas (Table 1). By the first postspray collection, both sprayed areas had significantly less budworm than the unsprayed area. This trend completely changed between the first and second postspray. By the second postspray, the NW block had significantly more budworm and less budworm mortality than the unsprayed area. In fact, the unsprayed area had the lowest budworm population and the highest budworm mortality.

In the final postspray sample, the only difference was significantly less budworm mortality in the NW block compared to both the SE block and the unsprayed area. Budworm mortality was high in all three areas, ranging from 94.2 to 97.6 percent. No significant differences existed for budworm survivors or defoliation. Defoliation ranged from 33 percent in the unsprayed area to 22 percent in the NW block.

a' le 1.--Summary of Passamaquoddy Forestry Department 1985 Spruce Budworm Project Data.[1]/

	PRESPRAY	POSTSPRAY 1	POSTSPRAY 2	POSTSPRAY 3
Unsprayed				
SBW/100 ft^2	2136 ± 235	1863 ± 190	322 ± 47	53 ± 12
SBW Mortality	-	-	84%	97.6%
Defoliation	-	-	-	33%
SE				
SBW/100 ft^2	1560 ± 150	994 ± 90	459 ± 54	45 ± 7
SBW Mortality	-	-	70%	97.2%
Defoliation	-	-	-	24%
NW				
SBW/100 ft^2	1505 ± 323	1121 ± 154	653 ± 11	77 ± 11.5
SBW Mortality	-	-	47%	94.2%
Defoliation	-	-	-	22%

[1]/ Mean ($\bar{x}$) ± standard error of the mean ($SE\bar{x}$)

DISCUSSION

The results indicate that spraying in 1985 did not protect spruce or reduce budworm population levels. Natural budworm mortality on spruce was very high and actual defoliation was much lower than expected.

By focusing our evaluation in two spray blocks, we were able to notice a differential response to treatment. Budworm mortality was significantly lower in the northwest block. However, defoliation was not greater in this block. And the first postspray results indicate that this block, as well as the southeast block, were significantly different from the unsprayed area.

The three postspray collections indicate that sprayed areas were significantly different from unsprayed areas in the first collection; then the differences disapapear by the second postspray collection. Perhaps spraying removes the weakest individuals of the population early--evident in the first postspray collection. Then the weaker individuals persisting in the unsprayed area begin to drop out between the first and second postspray collections. At the same time, the fitter budworms in the sprayed areas survive. Budworm mortality doubled in the northwest block between the second and third postspray collection. Therefore, spraying appears to cause a burst of budworm mortality immediately after spraying, then a period of relatively low budworm mortality followed by a second phase of accelerated mortality at the end of development.

We plan to continue this analysis in a subsequent report that looks especially at early and late flushing red spruce trees to see if spraying has a greater impact on either group.

APPENDIX A

Spruce bud index classes - taken from: Study of Spruce Budworm (Lepidoptera: Tortricidae) and Spruce coneworm (Lepidoptera: Pyralidae) behavior on Red spruce as it relates to host phenology and damaage. Spies, C.J., Stratton, R. D. 1985. Eco-Analysts, Inc., Report to Maine Forest Service. 66 p.d

Category	Description
1	Bud is constricted
2	Bud is swollen, scales beginning to separate, but no green needles visible
3	Bud capsule still intact but needles are clearly visible through scales in middle third of bud
4	Bud capsule split longitudinally, still attached to bud base
5	Bud capsule separated from bud base
6	Bud capsule lost completely, elongation beginning
7	Notable elongation commenced